



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B3/3 BYPASS RATIO (-): 5.4  
 UNIQUE ID NUMBER: 01P08CM104 PRESSURE RATIO  $\pi_{co}$  (-): 32.6  
 COMBUSTOR: Tech Insertion  
 ENGINE TYPE: TF RATED OUTPUT  $F_{co}$  (kN): 142.3

### REGULATORY DATA

CHARACTERISTIC VALUES:	$LTO_{mass}/F_{co}$ (mg/kN)	$LTO_{num}/F_{co}$ (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
LTO/ $F_{co}$ AND MAX nvPM <sub>mass</sub>	150.0	9.36E+14	3136
AS % OF CAEP/10 LIMIT	-	-	56.3
AS % OF CAEP/11 LIMIT (InP)	9.4	8.7	
AS % OF CAEP/11 LIMIT (NT)	56.1	27.5	

### MEASURED DATA

MODE	POWER SETTING (% $F_{co}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM <sub>mass</sub> ( $\mu\text{g}/\text{m}^3$ )
				EI <sub>mass</sub> (mg/kg)	EI <sub>num</sub> (particles/kg)	
TAKE-OFF	100	0.7	1.462	88.5	3.40E+14	
CLIMB OUT	85	2.2	1.153	62.7	4.15E+14	
APPROACH	30	4.0	0.369	2.3	9.14E+13	
IDLE	7	26.0	0.113	0.7	2.04E+13	
LTO TOTAL (kg, mg, number of particles)			478	15305	9.57E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{co}$ VALUES (mg/kN, particles/kN)				108.0	6.73E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				88.5	4.34E+14	2436

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% $F_{co}$ )	CORRECTED EMISSIONS INDICES	
		EI <sub>mass_SL</sub> (mg/kg)	EI <sub>num_SL</sub> (particles/kg)
TAKE-OFF	100	100.0	7.58E+14
CLIMB OUT	85	73.4	1.07E+15
APPROACH	30	3.5	5.05E+14
IDLE	7	1.0	9.47E+13

### AMBIENT CONDITIONS

	From		To		FUEL			
	BAROMETER (kPa)	TEMPERATURE (K)	HUMIDITY (kg water/kg dry air)	HEAT OF COMBUSTION (MJ/kg)			HYDROGEN CONTENT (%mass)	AROMATICS CONTENT (%vol)
	99.5	295.5	0.0066	100.2		43.27		
				311.8		13.83		
						18.7		
						0.67		
						519		

MANUFACTURER: CFM International  
 TEST ORGANIZATION: Safran Aircraft Engines  
 TEST LOCATION: Villaroche, France  
 TEST DATES: 25/07/2019-30/07/2019

### REMARKS

1. Engine 849-166/1
2. Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B
3. Also covers CFM56-5B3/3B1